

Title: Symmetry, Transformations, and Tessellations using Tangrams-The Tanazon Rain Forest

Brief Overview:

This unit will cover line(s) of symmetry, transformations (slides, flips, and turns), and tessellations using tangrams. Rainforest animals will be created in this unit by using tangrams shapes. The concept of the rainforest will be developed throughout this unit. Identification of line symmetry will be developed by using a Symmetry Design Map. Transformations will be drawn and labeled on graph paper. Tessellation designs will be created to display on a bulletin board. The completion of the lesson will be a rainforest bulletin board display showing animals and trees.

NCTM Content Standard/National Science Education Standard:

Geometry

- Analyze characteristics and properties of two-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- Apply transformations and use symmetry to analyze mathematical situations;
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

Grade/Level:

3rd/4th grade

Duration/Length:

3 days/ 90 minutes

Student Outcomes:

Students will be able to:

- Analyze and create a transformation.
- Identify or describe symmetry in geometric figures, picture, and real life situations.

Materials and Resources:

- Pencils
- Rulers
- Tangrams (overhead)
- Tangrams
- Pattern Blocks
- Math Journals
- Transparencies
- Glue
- Colored pencils / crayons / markers
- Construction paper
- Tape

- Books- A Walk in the Rain Forest by *Rebecca L. Johnson*, Here is The Tropical Rain Forest by *Michael Rothman*, Rain Forest Babies by *Kathy Darling*, and The Great Kapok Tree by *Lynne Cherry*
- Teacher Resource 1 Tangram
- TR2 Tangram continent & tree
- TR3 Squirrel Monkey & Macaw
- TR4 Butterfly
- TR5 Iguana & Tomandua
- TR6 White-Lipped Peccaries
- TR7 Jaguar
- TR8 Fact sheet
- TR9 Tessellation Directions
- Student Resource 1 Tangram
- SR2 Graph Paper
- SR3 Symmetry Design Mat
- SR4 Brief Constructed Response 1
- SR5 BCR2
- SR6 Scavenger Hunt Paper
- SR7 KWL Chart
- SR8 Tessellation Directions
- SR9 BCR3

Development/Procedures:

Lesson 1

Preassessment – Display a tangram using the overhead projector (TR1). Students will activate prior knowledge (teacher may use a KWL chart or Brainstorming) about tangrams and discover the various shapes within the tangram.

Launch – Students will be given a tangram template. Students will carefully cut out the tangram template (SR1). Read the book [A Walk in the Rain Forest](#) by Rebecca L. Johnson aloud to the students. Display the tangram animals (teacher must make transparency of each animal) from the story on the overhead projector (TR2-TR7). Students will manipulate tangram pieces to duplicate tangram animal pictures shown on the overhead projector.

Teacher Facilitation – Instruct students to work in pairs to develop their own definitions. Allow time for students to share their ideas. Using the students' responses, help students decide on a class definition of symmetry. The students will record the class definition in their math journals. Model symmetry utilizing various objects within the classroom (door, book, desk, etc.)

Student Application – Students will explore tangram shapes and use graph paper (SR2) to trace and label tangram pieces. Students will use the Symmetry Design Mat (SR3) to identify and draw the line(s) of symmetry for each shape.

Embedded Assessment –Student will create his / her own tangram animal that will be displayed on a Tangram Rain Forest Bulletin Board. Student will complete a BCR on symmetry using tangram shapes (SR4).

Reteaching/Extension –

- Students will use pattern blocks or (SR3) and Symmetry Design Mat (SR2) to find line(s) of symmetry.
- www.harcourtschool.com
- <http://regentsprep.org>
- <http://www.math.okstate.edu>

Lesson 2

Preassessment – Initiate a discussion on transformations (rotation/turn, translation/slide, and reflection/flip). Students will draw and label each transformation in their math journals.

Launch- Revisit the overhead tangram animal pictures (TR2-TR7). Allow students to model transformations (rotation, turn, translation/slide, and reflection/flip) of tangram manipulatives on the overhead projector.

Teacher Facilitation-Model transformations (rotation/turn, translation/slide, and reflection/flip) to further develop the concepts of transformations. Instruct students to place tangram pieces side by side. Students need to turn one of the figures at an angle. Allow students to explore turning their pieces.

Teacher will model flips and slides using the previous example.

Model how to make a tangram animal using transformations on the overhead projector.

Student Application - Students will create and label their own flips, turns and slides on graph paper. As students work in pairs making tangram animals, they should use transformation vocabulary (flip, turn, slide, translation, reflection, and rotation) to direct a partner's moves. Students will begin their tangram animal using the square shape; one student will give the partner directions for transforming the shapes into the tangram animal of his/her choice. Students will use graph paper to help line up the figures.

Embedded Assessment-After each partner has taken his/her turn making a tangram animal, students will label the transformations on the tangram animals.

In their math journals, students will complete the following writing prompts:

A turn is and one example I see in our classroom is.....

A reflection is.....and one example in the classroom is.....

Students will complete a BCR (SR5)

Reteaching/Extension-

- Students will go on a Tanazon Rain Scavenger Hunt (SR6). They will chart slides, turns, and flips found in real life situations.
- <http://garnet.acns.fsu.edu>

- <http://www.schools.ash>
- Students will create either a class or individual picture book using tangrams or tessellations as their illustrations.

Lesson 3

Preassessment –Distribute the tangram shapes. Revisit the previous lesson on transformations. Students will be asked to give examples of slides, flips, and turns using tangram pieces. Students will use a KWL chart to activate prior knowledge (SR7). Ask students to complete the “K” section of the chart using what they know about tessellations.

Launch- The student will fill in the W on their KWL chart. The teacher will introduce vocabulary words: tessellation, plane, vertex, angle, and adjacent. Explore the three attributes of tessellations-

1. Tessellations are repeated patterns. Ask students if they can find examples of repeated patterns in the classroom. Explain that tessellations are a very specific kind of repeating pattern and that not all patterns can be called tessellation.
2. Tessellations can continue on forever and ever.
3. Tessellations do not have overlaps or gaps.

Teacher Facilitation-Teacher will model how to create a tessellation on the overhead projector. Give students step by step directions as they create a tessellation. (SR8)

Student Application-Student will review student direction handout. Students will follow the student directions and create a tessellation tile.

Embedded Assessment- Students will create their own tessellations that will be used as a Tangram Rain Forest background. Students will complete a BCR (SR9).

Reteaching/Extension-

- Students will create tessellations using pattern blocks. (SR10)
- Students will experiment to find other ways shapes can tessellate
- www.learnpysanky.com
- www.coolmath.com
- MECC TESSELLMANIA Software

Summative Assessment:

The teacher will assess the students’ animal tangram pictures, their drawings, their labeling of the flips, and their slides of the tangrams. The rainforest bulletin board display along with the brief constructed response may be utilized as an assessment.

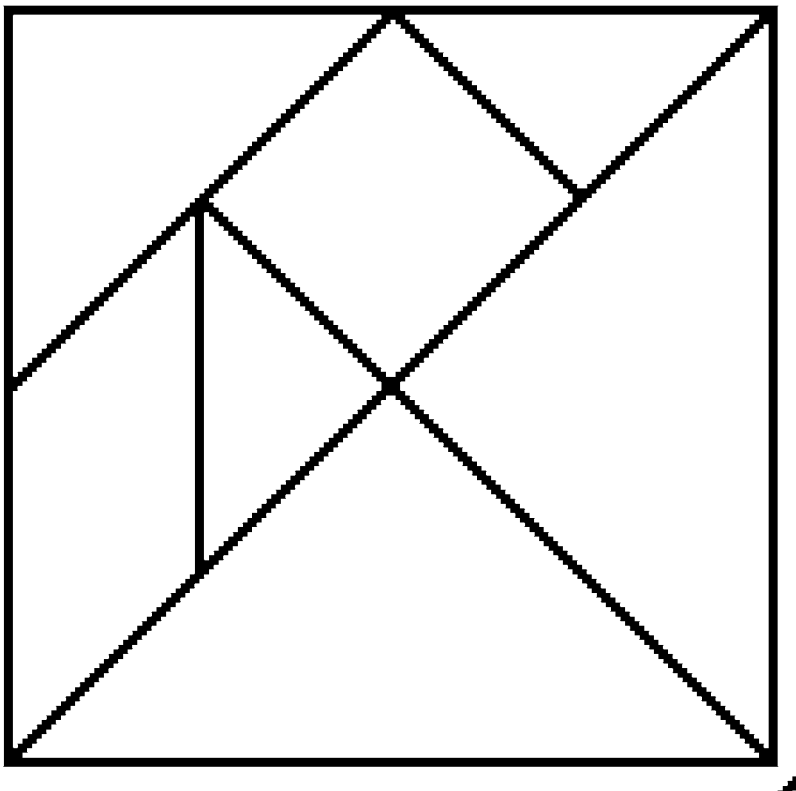
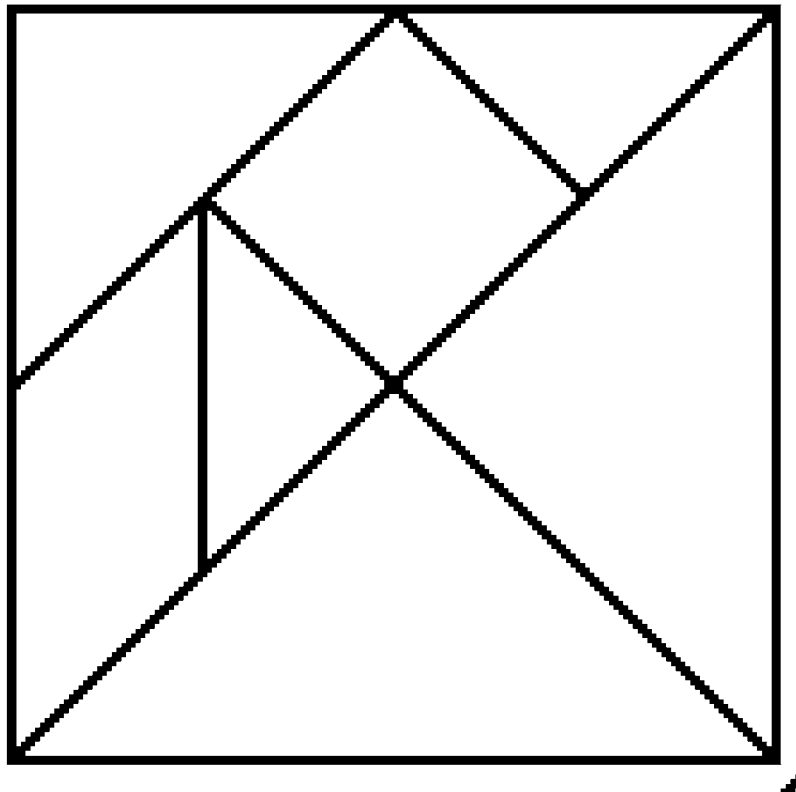
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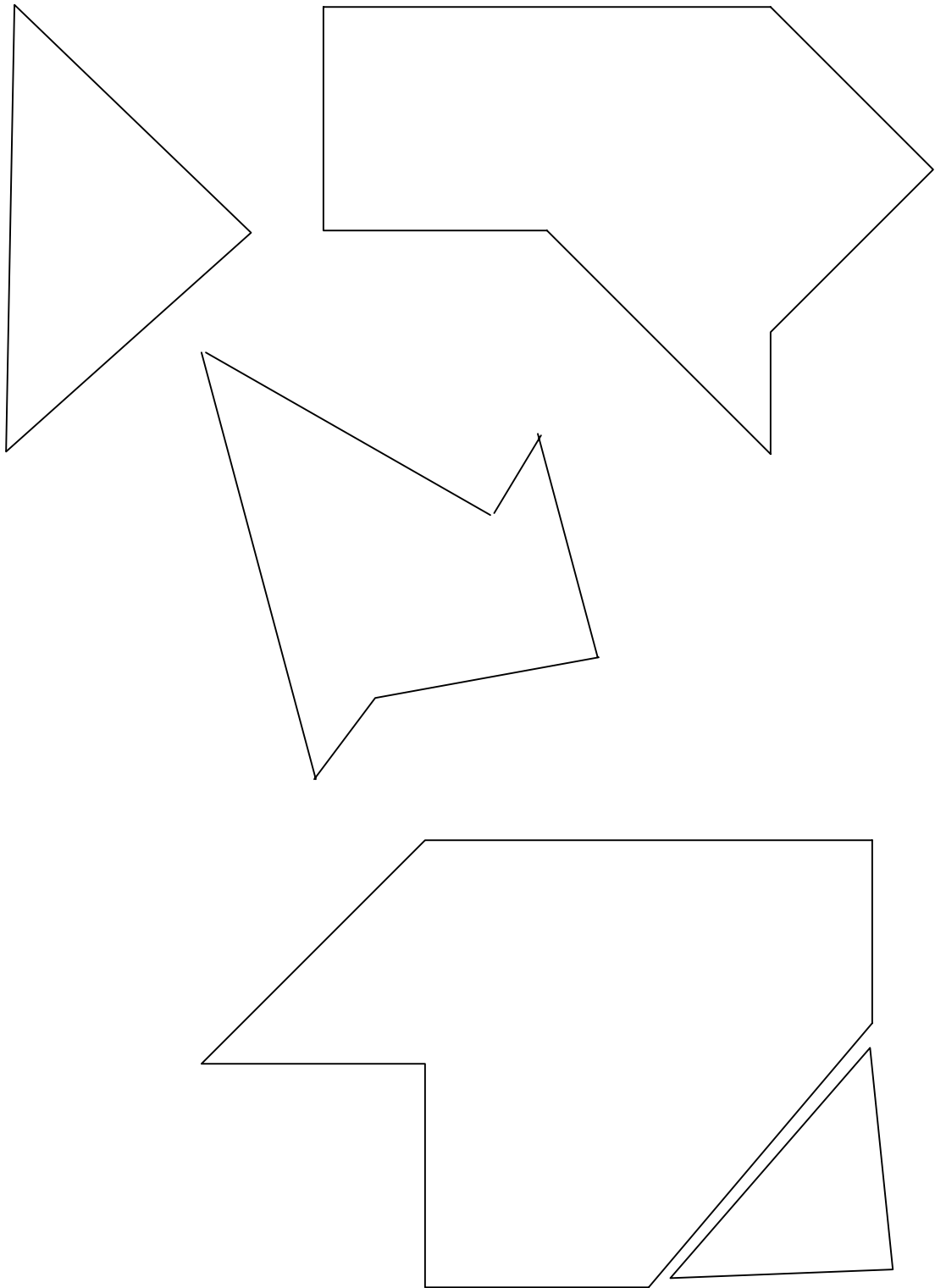
TR1

TANGRAM PATTERNS



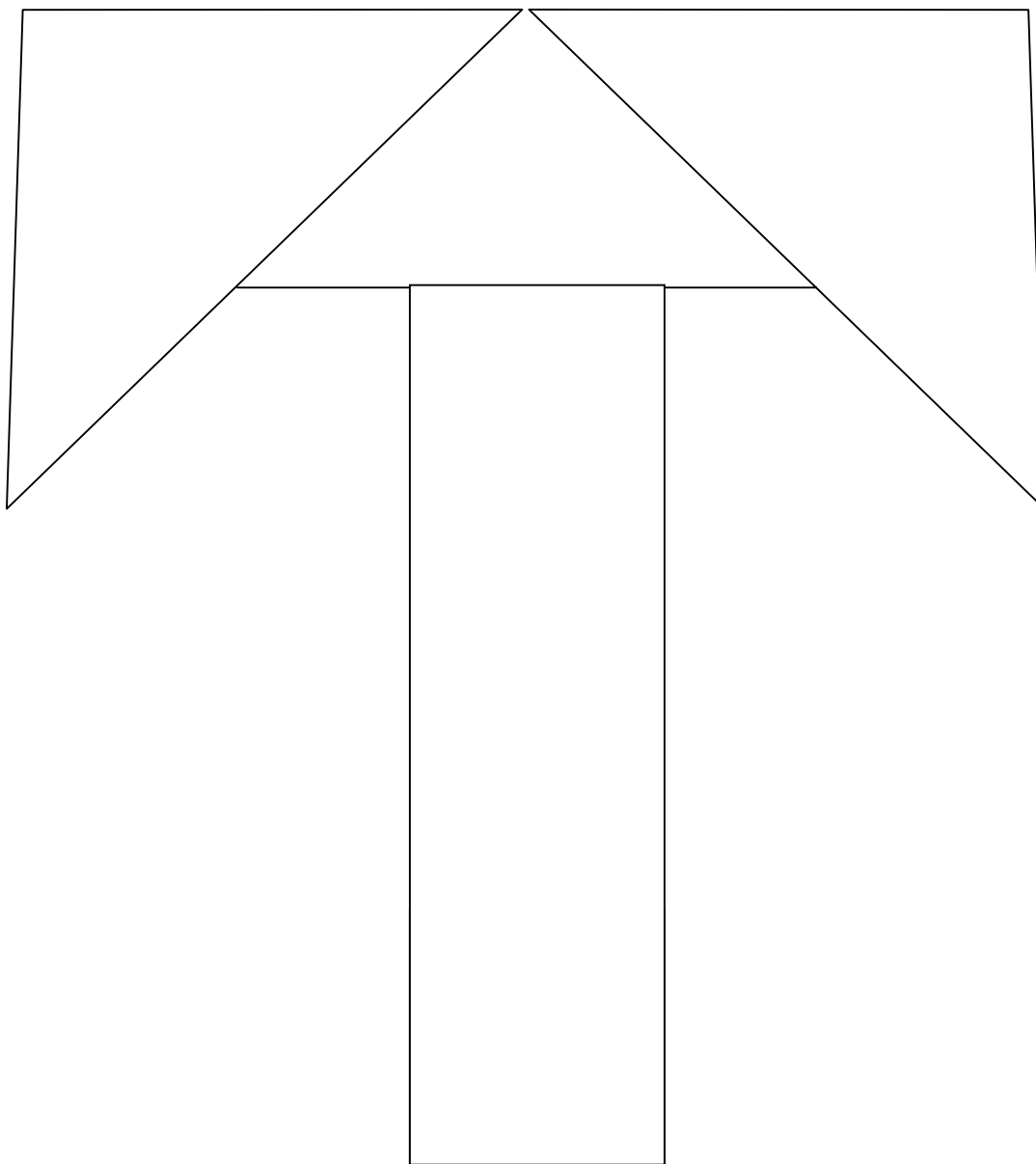
TR2

Tangram Continents



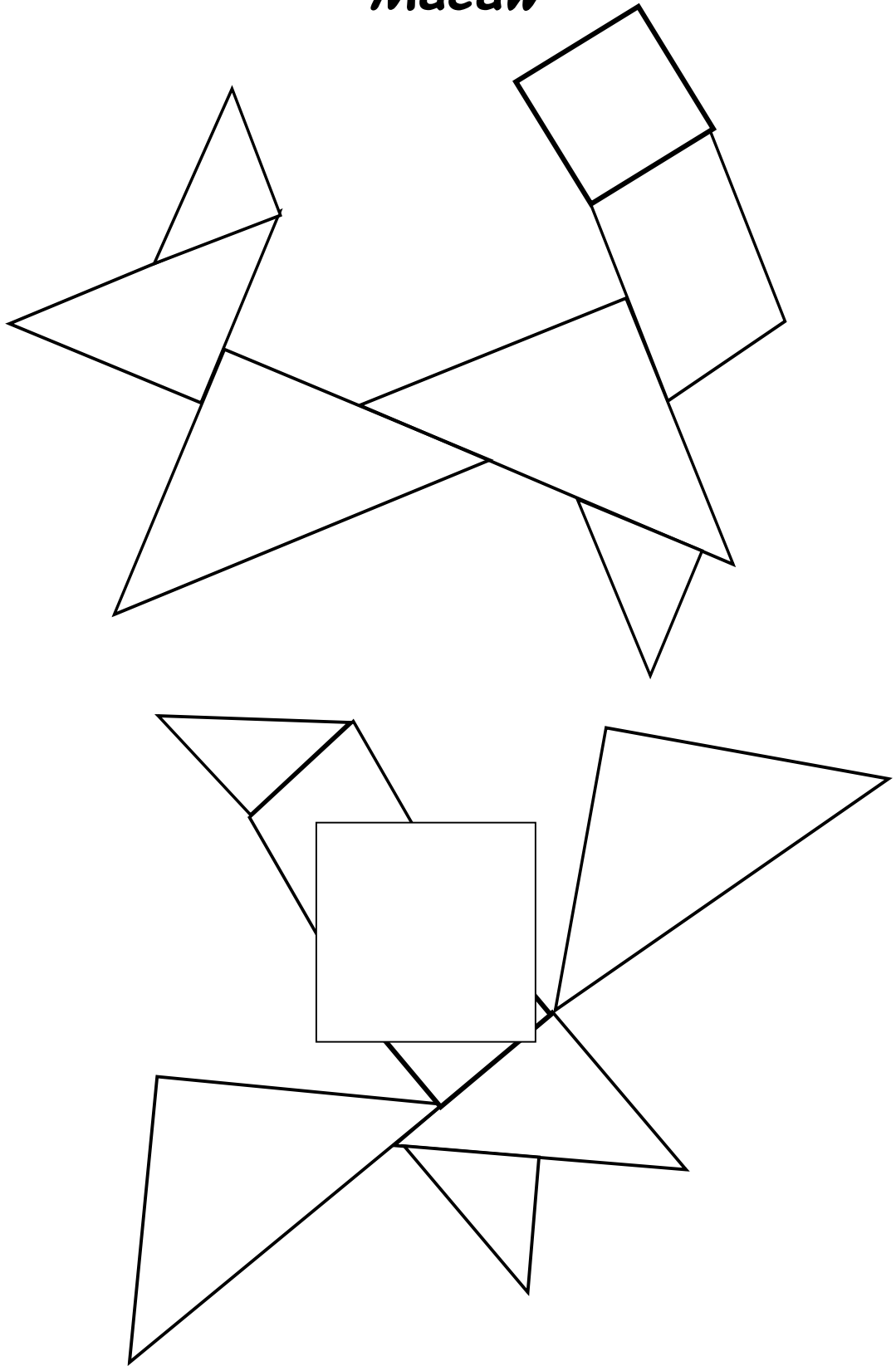
TR2A

TANGRAM TREE



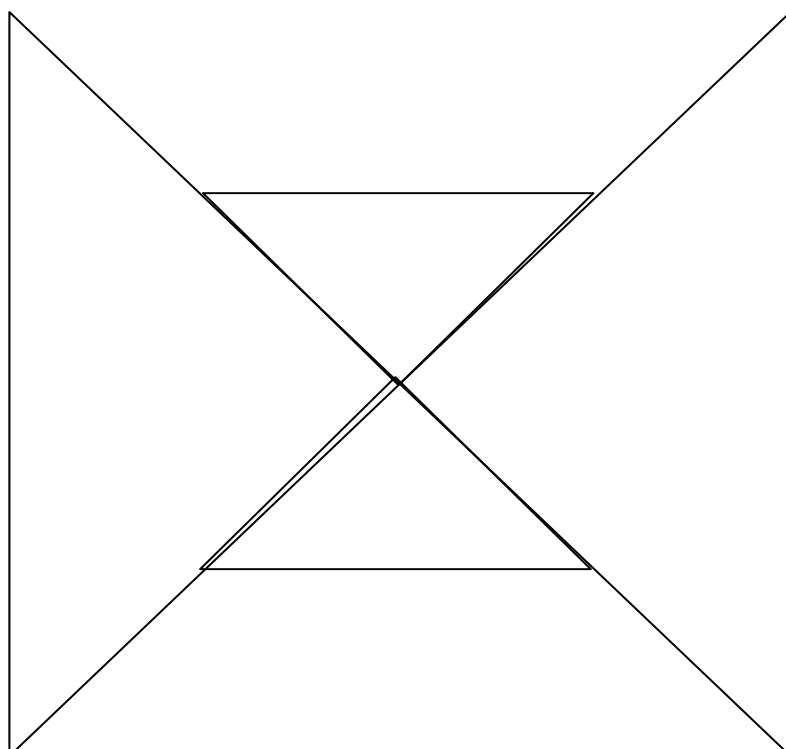
TR3

Tangram Squirrel Monkey and Macaw



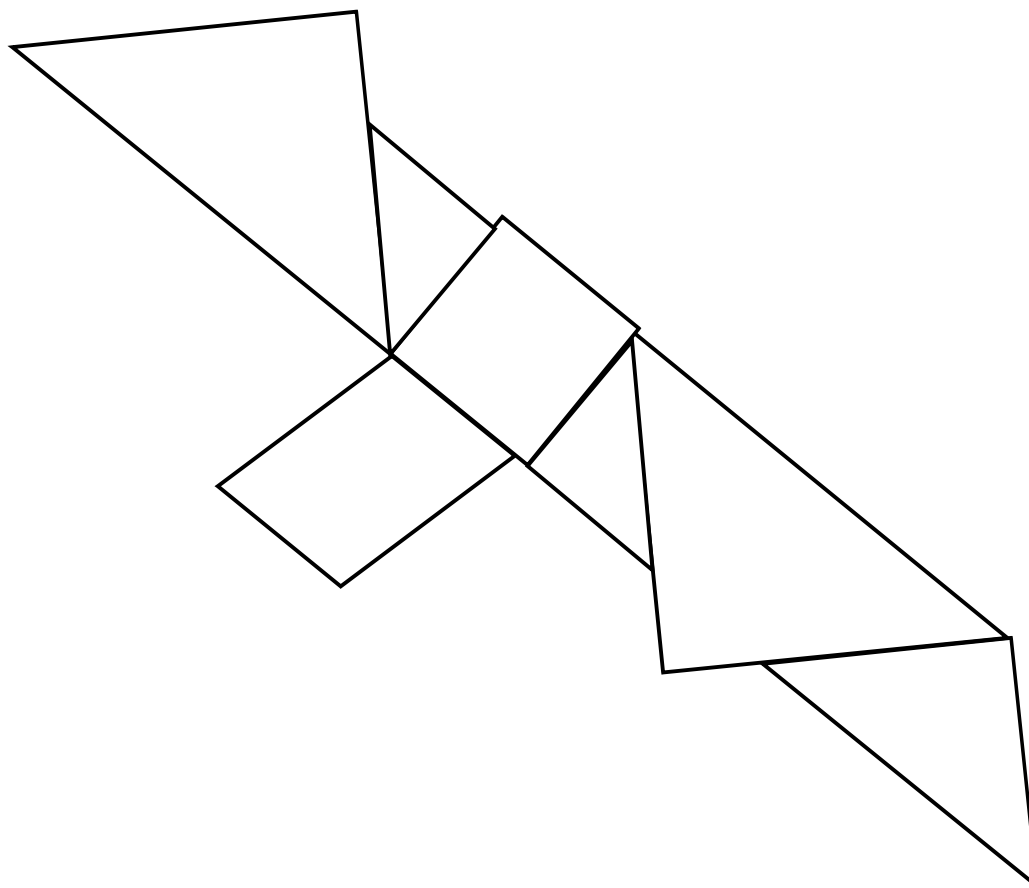
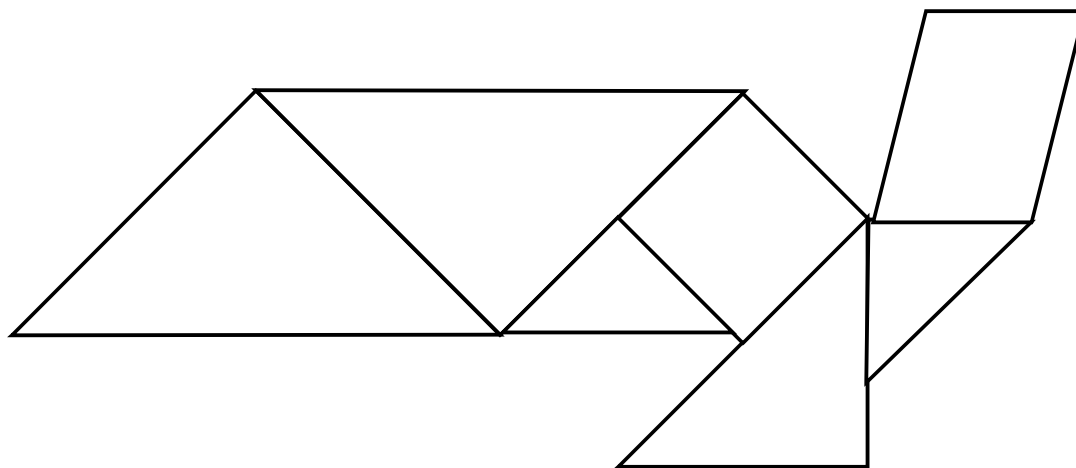
TR4

TANGRAM BUTTERFLY



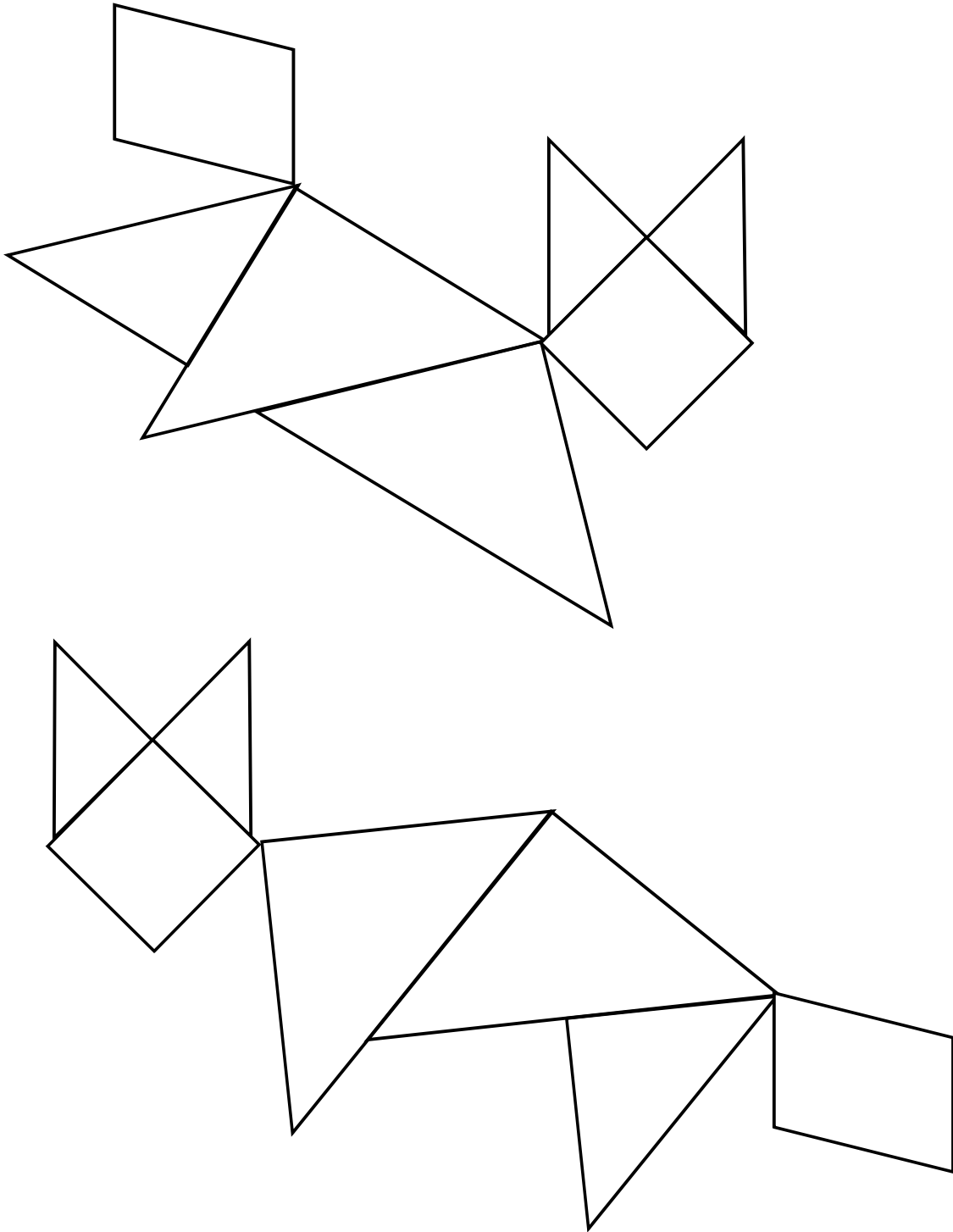
TR5

Tangram Iguana and Tomandua



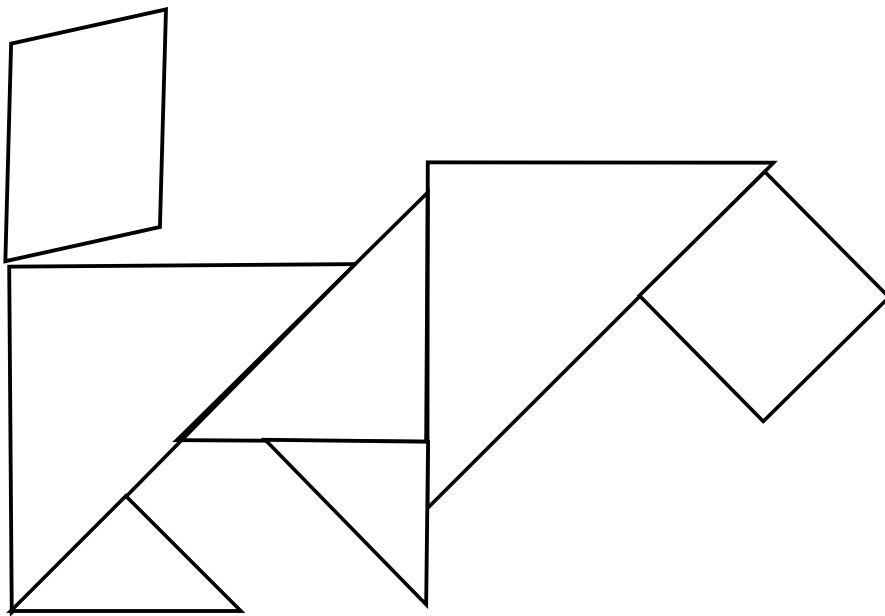
TR6

*Tangram White-Lipped
Peccaries*



TR7

Tangram Jaguar



Tanazon Rainforest Fact Sheet

Plants

Bromeliads

Bromeliads are found in the rainforest. Bromeliads have thick, waxy leaves that have a bowl like shape. The bromeliads plant is related to the pineapple family. Bromeliads can hold gallons of water.

Epiphytes

Epiphytes are known as an air plant. It found mainly on branches, trunks, and some leaves of tress. They are found in the canopy of the rainforest.

Orchids

Orchids are also found in the rainforest. They have a pattern of three petals and three petal-like sepals. Orchids vary in size, shape and color.

Lianas

Lianas are a vine that is found in the rainforest. They are a type of climbing vine. Lianas have thick, woody stems that are found in different lengths and shapes. They are found in the forest floor of the rainforest.

Carniverous Plants

Carniverous plants are found in the rainforest. These types of plants receive their nutrients form animal matter. Some types of carniverous plants are: the Venus fly trap and the pitcher plants.

Saprophytes

Saprophytes are organisms that are found in the rainforest. That responds as the rainforests decomposers. There are many types of saprophytes that can not be seen.

Tanazon Rainforest Fact Sheet

Animals

Butterfly

There are butterflies in the rainforest that have wing patterns that indicate to other animals that they are poisonous. The other butterflies try to duplicate the same patterns to deceive the predators.

Sloth

The sloths are shy and quiet. There are two types of sloths that are found in the rainforest (three-toed and two toed). The sloths may live for about ten years. The sloths sleep in trees upside down. They are found in the canopy of the rainforest.

Jaguar

Jaguars live in the rainforest. They climb trees and swim in water to capture prey. Jaguars are fast runners. The jaguar hunts weaker animals in order to win the battle. They are found in the forest floor of the rainforest.

Macaw

Macaws are blue and yellow birds that are found in the rainforest. They have colorful tails and white faces. Macaws live in South America. They are found in the canopy of the rainforest.

Chameleon

Chameleon is found in the rainforest. Chameleons change color according to the temperature. The chameleon is able to catch insects by its very long sticky tongue. They are found in the understory of the rainforest.

Gorilla

Gorillas live in Zaire, Africa. They are very large animals. Gorillas can weigh up to 600 pounds and up to 5'6" tall. They have coarse black hair. Although they have a scary appearance they are gentle animals. They are found in the forest floor of the rainforest.

TR9

Tanazon Rainforest Fact Sheet Animals

Frog

Frogs in the rainforest can be poisonous. The frogs are golden in color. This is a sign that the frog will use before releasing the poison. They live in the forest floor.

Tiger

Tigers are found in the rainforest Rainforest tigers are the smallest of the tigers in weight. The tiger's enemy is a human. They are found in the forest floor of the rainforest. They are found in the forest floor of the rainforest.

Kangaroo

The kangaroo lives in the forest floor of the rainforest. Baby kangaroos are called "joey". Adult weight for a kangaroo is 10 pounds. There are some other types of kangaroos that hop on treetops.

Sugar Glider

A sugar glider is found in the rainforest in a hollow tree. It jumps and leaps out of trees to retrieve the sweet sap. They live in the canopy of the rainforest.

Monkey

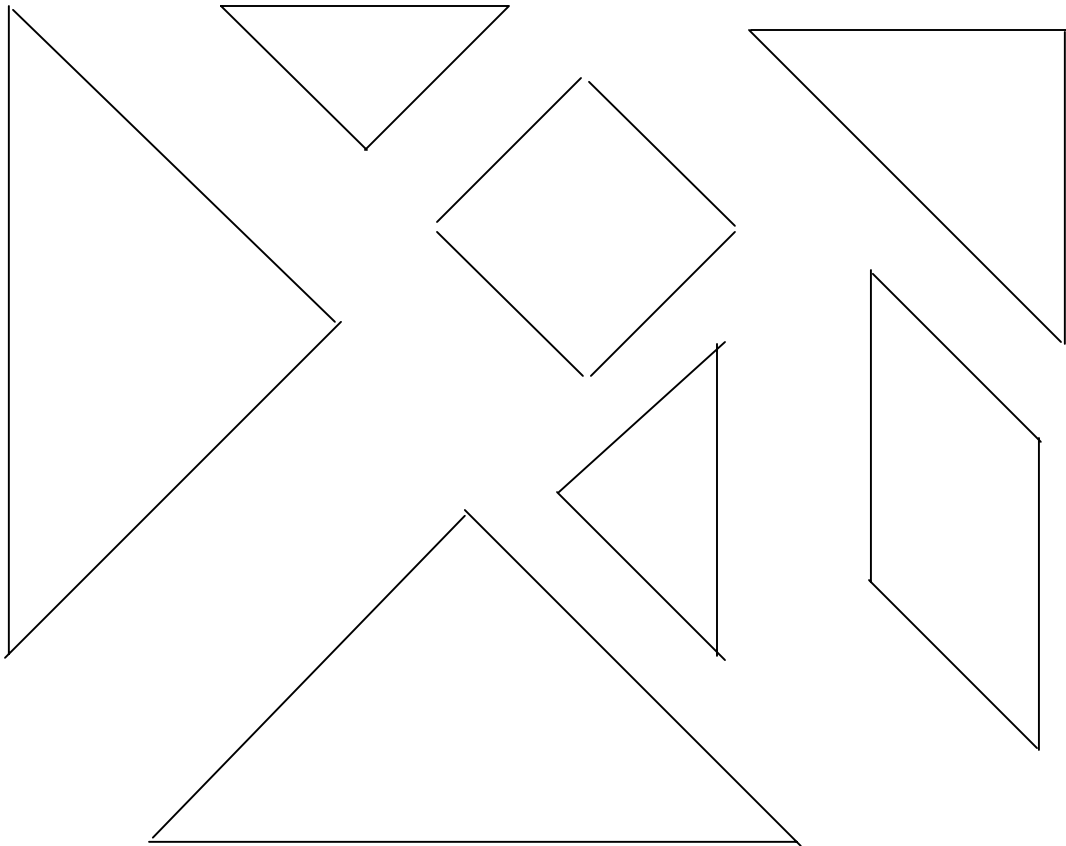
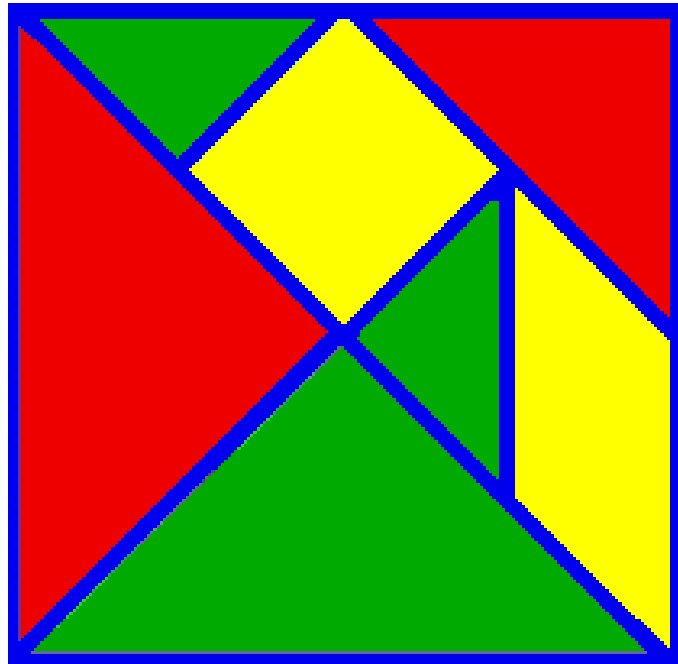
A monkey is found in the understory or canopy of the rainforest. They eat fruit, insects, leaves and seeds. They have long tails.

Lemur

A lemur is found in the understory and the canopy of the rainforest. They leap through the trees. There are about 30 different kinds of lemurs in Africa.

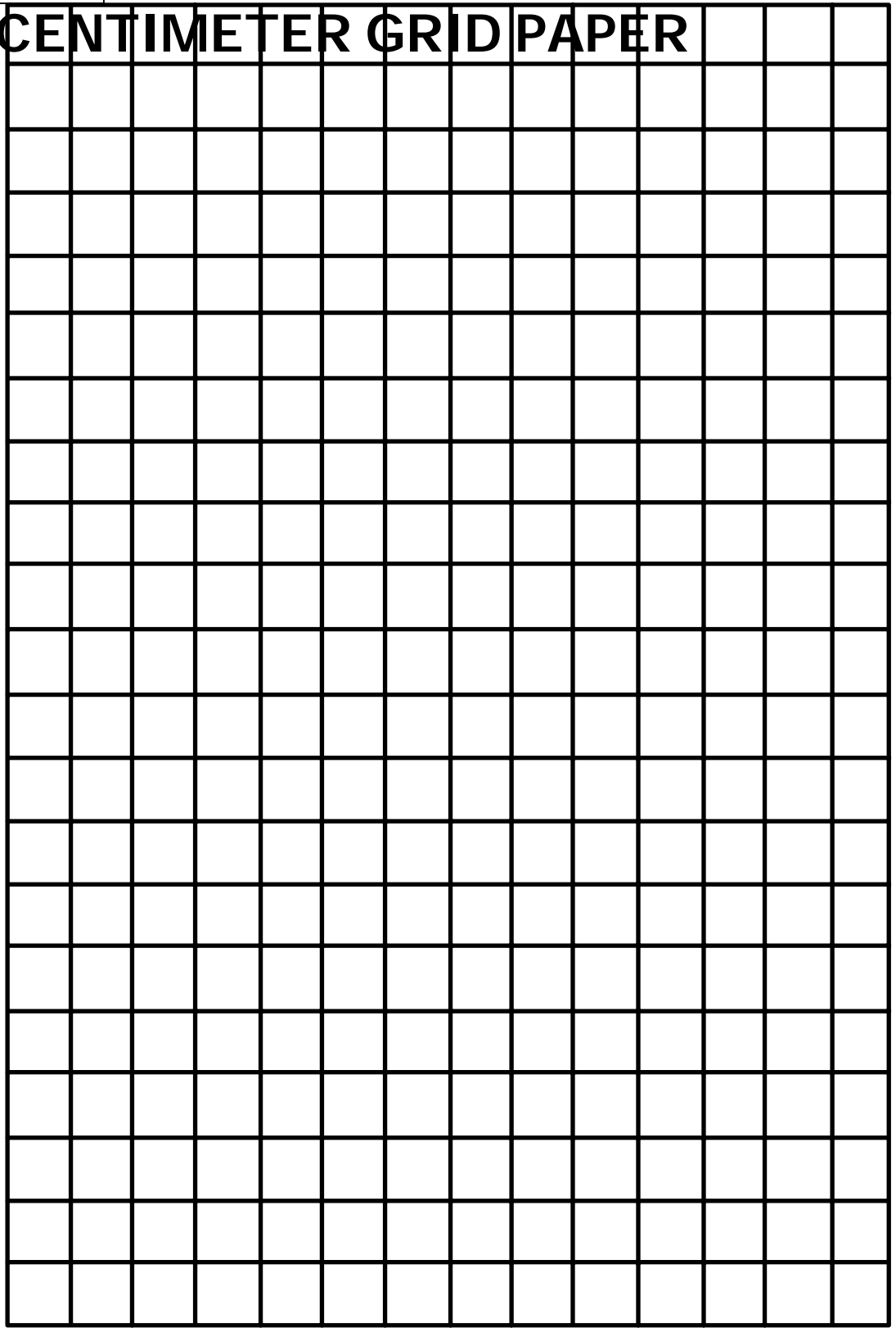
TANGRAM

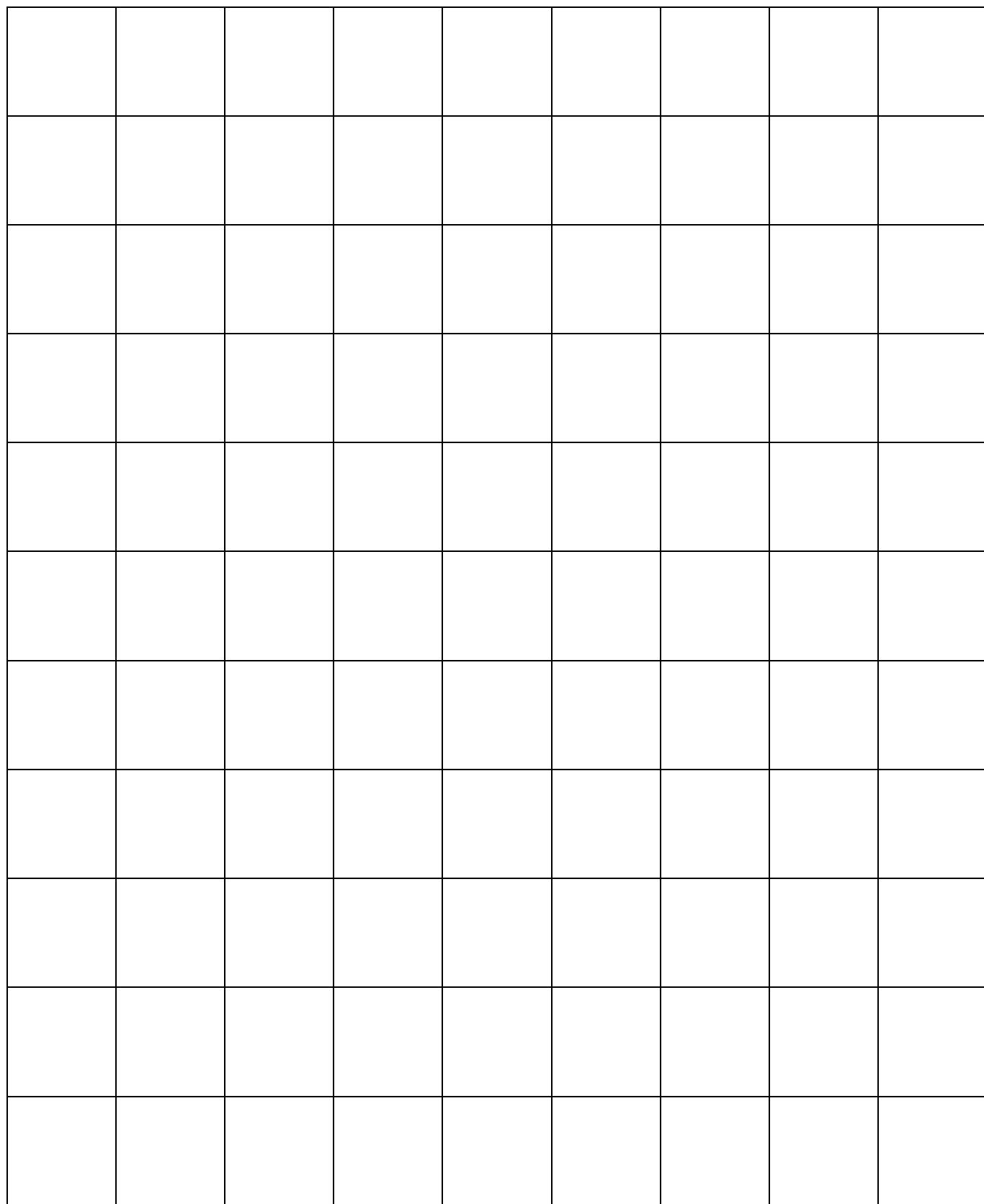
SR1



SR2

CENTIMETER GRID PAPER





SR2A

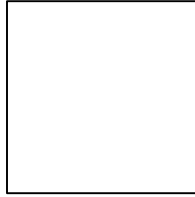
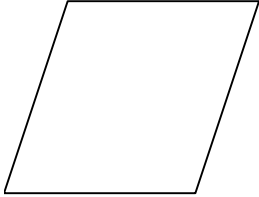
Two-Centimeter Grid Paper

Symmetry Design Mat



Part A

Tell which shape has 2 lines of symmetry.

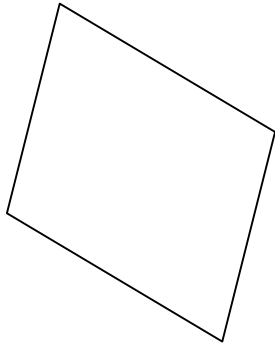


Part B

Use what you know about tangrams and lines of symmetry to explain why your answer is correct. Use words and/or numbers in your explanation.

Part A

Complete. Draw a parallelogram to demonstrate a flip.



Part B

Use what you know about flips, slides and rotation to explain why your drawing is correct. Use words and/or numbers in your explanation.

SR6

Tanazon Rainforest Scavenger Hunt



Slides	Flips	Turns

SR7

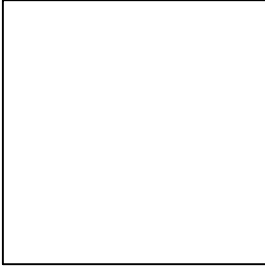


K	W	L

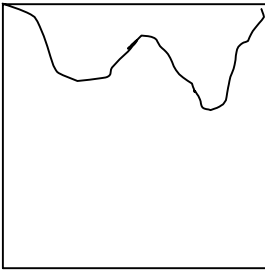
SR8

Tessellations Directions

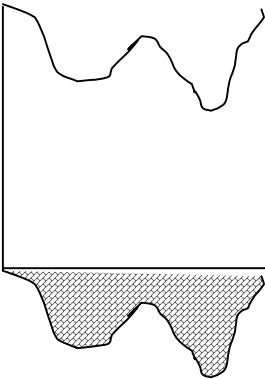
1. Draw a curved line from vertex to vertex on your tangram.



2. Cut out your curved line. Slide your curved piece. (DO NOT flip it or turn it.)

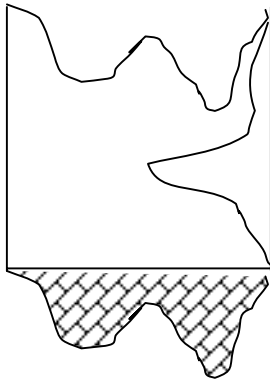


3. Slide the piece to the opposite side of the shape.

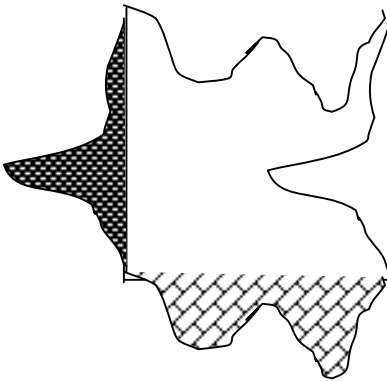


SR8

Tessellations Directions



4. Trace your new shape on a sheet of paper repeatedly without flipping or turning the piece.



5. Repeat step 5 until the page is filled.

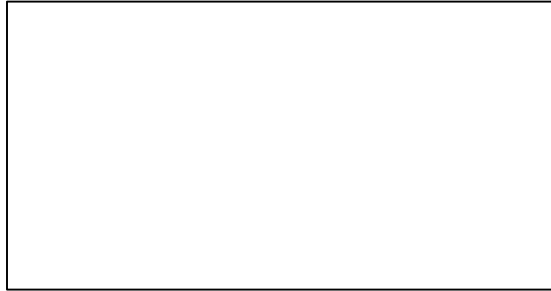
6. You may color or decorate your paper after you have completed filled the paper with your tessellation.

SR 9

BRIEF CONSTRUCTED RESPONSE

Part A

Create a tessellation on the rectangle using slides.



Part B

Use what you know about tessellations to explain why your answer is correct. Use numbers and/or words in your explanation.

